CASE SERIES

Innovative way to break the stone: Master lithoclast for bilateral simultaneous Percutaneous Nephrolithotomy

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Abstract

The objective of our study was to evaluate the efficacy of Master Lithoclast, also known as trilogy lithoclast, in simultaneous bilateral Percutaneous Nephrolithotomy (PCNL). The study was a prospective case series, involving 40 patients undergoing bilateral simultaneous PCNL, with 20 (50%) males and 20 (50%) females. The mean age of subjects was 32.9±7.9 years. In Guy's stone scoring 7(17.5%) patients classified in Group I, 28 (70%) in group II and the remaining 5(12.5%) patients were placed in group III. Total operative time observed was 74.8±17.9 minutes. Complete stone clearance was observed in 30 (75%) patients. In conclusion, study data confirmed that Master Lithoclast provides faster stone clearance and is unaffected by the composition of stones, ease of usability, and improved tissue safety with reduced chances of fragments blocking are key factors.

Keywords: Master lithoclast, Simultaneous bilateral PCNL, Trilogy lithoclast, Renal stone.

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Introduction

The increasing burden of urinary tract stones requires safe, affordable, and effective treatment. Bilateral renal stones have life-threatening risk factors for instance obstructive uropathy and renal failure, hereafter, consideration of immediate interference is necessary.[1-3] Recently, simultaneous bilateral PCNL is gaining popularity due to decreasing the financial burden as well as physical trauma to the patients with complete stone clearance. Although the lengthy operative time causing more need of anaesthesia, higher risk of bleeding, and longer hospitalisation stay are still to be considered for further evaluation.[4,5] A reporting system was analyzed in the study to grade the complexity of percutaneous nephrolithotomy to foresee the stone-free rates before the procedure. Guy's stone score is divided into four grades according to location, the number of stones, and the anatomy of the kidney. Guy's stone score is completely based upon all stones present in the renal system and not only targetted for a procedure. In our study Guy's stone score predicted the success rates of simultaneous Percutaneous nephrolithotomy.[6]

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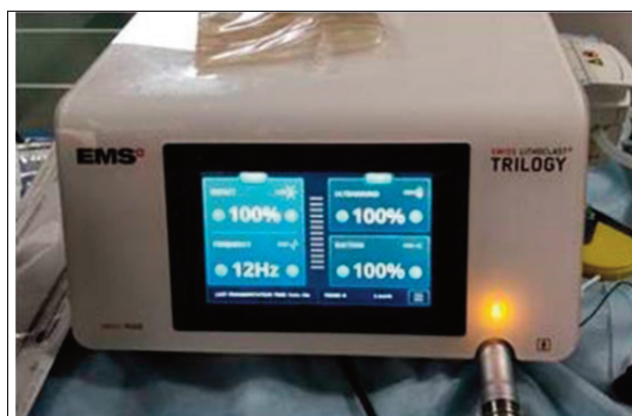

Figure: Lithoclast Trilogy.

About the device: Lithoclast Trilogy also known as Master Lithoclast, is a dual-energy lithotripter, which combines ultrasonic energy with electromagnetic energy for stone fragmentation. The overall frequency of impact of the device can be adjusted between 1 and 12 Hz. Dual energies of the device can be depleted together to break hard and large stones easily.

Case Series

This was a prospective cohort study including 40 patients with bilateral renal calculi admitted in Liaquat University of Health Sciences Hospital, Jamshoro. All patients were subjected to bilateral simultaneous PCNL. The study period extended from 6th January 2021 till 30 March 2021. Patients older than 18 years of age with bilateral renal stones were included in the study. The exclusion criteria were as follows: Any severe heart-related problem, coagulation disorder or patients on blood-thinning medicines, pregnant women and any subject with contraindications for general anaesthesia. Of the 43 patients, 3 were excluded due to the inaccessibility of renal stones and other factors. Two patients showed staghorn stones bilaterally. After inducing general anaesthesia, the first PCNL was performed on the symptomatic side, and then the other side simultaneously, 18–24 Fr Amplatz sheath was used for tract dilatation under fluoroscopic

control. After completion of surgery from both sides, fluoroscopy was performed to ensure complete clearance of stone fragments. Nephrostomy drainage was reserved for 15 patients. Double J stent was introduced in 20 patients bilaterally; the urinary catheter was clamped after 4–6 hours of surgery. Five patients required double puncture on the right side for better access to stone while no patient needed it on the left side. SPSS 23 was used to analyze the data. Data were expressed as percent; mean and standard deviation.

Results

Of the 40 patients enrolled in this study, 20 (50%) were males and 20 (50%) females. The mean age of the patients was 32.9±7.9 years. The mean age of males was 34.3±.3 whereas in females it was 31.5±5.8 years. Guy's stone scoring[6] was used to determine the stone-free rates after percutaneous nephrolithotomy. A single stone in the pelvis or mid calyx with no anatomical abnormality, was called Group I and included 7(17.5%) patients. A single stone in Upper calyx without any anatomical abnormality was placed in group II and had 28(70%) patients. The remaining 5(12.5%) patients had multiple or partial staghorn stones with no anatomical abnormality and were placed in group III of Guy's stone score. Ultrasonography of KUB (Kidney, Ureter and Bladder) was performed in every patient to evaluate the location, size, and number of stones. CT pyelogram was done for precise evaluation of the stone burden. Dual-energy master Lithoclast was used to break the stones during the procedure. Hypertension was reported in males only who were subjected to BLL procedures performed under fluoroscopy guidance. Patients were transferred to the urology unit after surgery for post-operative care. Confounding factors were determined as age, sex, co-morbidities, and drug usage. Laboratory evaluation included serum creatinine estimation for observing the difference between preoperative and postoperative values (-0.10 ± 0.3 mg/dL). Creatinine values were evaluated on post Op day 01 (1.5±1.5mg/dL), Day 06 (1.2±0.3 mg/dL) and Day 12 (1.09±0.1 mg/dL), with the difference between day 01 to day 12 being 0.4±1.51 mg/dL. The variability in values of serum urea and haemoglobin between pre and post-operative state was (38.1±2.6 mg/dL) and (0.39±0.32 g/dL) respectively. Urine Culture was done for every patient before the surgery, Nephrostomy was placed in 15 (62.5%) patients while DJ stent was used in 20 (50%) patients. Total operative time was 74.8±17.9 minutes. The mean postoperative hospital stay was 3.6±0.6 days. Complete stone clearance was observed in 30 (75%) patients (Table-1).

Table-1: Characteristics of Patients.

Mean Age	32.9±7.8 Years
Mean stone burden (Right)	3.13±0.5 cms
Mean stone burden (Left)	3.11±0.4 cms
Mean Operative Time	74.80±17.9 mins
Mean Hospital stay (Days)	3.6±0.6 days
Mean Creatinine Difference	-0.10±0.3 md/dL
Mean Creatinine difference between day 01 to day 12	0.46±1.5 mg/dL
Mean Haemoglobin difference	0.39±0.3 mg/dL

Table-2: Treatment outcomes after surgery.

Variables	n (%)
Guy's stone score	
Grade I	7 (17.50)
Grade II	28 (70)
Grade III	5 (12.50)
Stone free rate	
Complete clearance	30 (75)
Incomplete clearance	10 (25)
Complications	
Fever	15 (37.50)
Haematuria	9 (22.50)
Post OP Pain	
Mild	2 (5)
Moderate	38 (95)
Blood Transfusion	
Yes	5 (12.50)
No	35 (87.50)
Nephrostomy	
Yes	15 (37.50)
No	25 (62.50)
DJ stent	
Yes	20 (50)
No	20 (50)
Second Procedure	
ESWL	10 (25)

Complications: Most commonly noted complication in bilateral simultaneous percutaneous nephrolithotomy was bleeding with drop of Haemoglobin of 0.10 G in 2 (5%), 0.20 in 5 (12.5%), 0.50 in 14(35%), 0.70 in 5(12.5%) and 1.0 observed in 4(10%) patients, followed by prolonged operative time. Residual stones were noted in 10 (25%) patients with the requirement of another supporting procedure to remove residual stones. Blood transfusion was prescribed in 5(12.5%) patients. Post-operative pain was differentiated as mild in 2(5%) and moderate in 35(95%) patients. Mild to moderate haematuria was noted in 9 (22.5%) patients postoperatively along with fever in 15(37.5%). First post-operative follow up was scheduled after 6 days of surgery. Five (12.5%) patients complained of mild haematuria and 2(4%) reported persistent pain on the first visit. Double J stent was removed after 06 weeks of surgery. (Table-2).

Discussion

Bilateral renal stones in the paediatric and adult population are not rare in many underdeveloped countries. Pakistan records hundreds of new renal stone cases annually.[7]

Neglected renal stones can cause life-threatening conditions such as Renal failure.[8] To remove renal calculi percutaneous nephrolithotomy is the method of choice for urologists from decades.[9] Bilateral renal stones removal required sequential procedures at an interval of 3 to 4 weeks, with separate anaesthesia administration, laboratory investigations and hospital stay, and increased financial as well as a psychological burden to the patient and family. Bilateral simultaneous PCNL is a way to perform PCNL on both sides in a single sitting.[10] The advantages of simultaneous bilateral PCNL include a single anaesthesia session, comparatively decreased operative time, and lesser financial burden.[11] However, extracorporeal shockwave lithotripsy is still the first choice procedure for many patients but large, staghorn or multiple stones can be removed via PCNL more conveniently and stone-free rates are higher in PCNL than ESWL(Extracorporeal shock wave lithotripsy).[12] With experience, PCNL gained improvement in stone-free rates and decreased residual stones with other complications. In our study, the Operative time increased to 74.8±17.9 minutes as compared to unilateral operative time which was 60.62±30.70 minutes.[13] Blood loss was measured with calculating the haemoglobin drop after surgery 0.39±0.32 g/dL which is lower than unilateral PCNL HB drop from a comparative study with 1.39 g/dL[14] and 05 (12.5%) cases requiring blood transfusion. Another study reported only one blood transfusion in 39 patient's data.[14] Excluded are Grade III and Grade IV patients, those with anatomical abnormalities and multiple complex stones who are a challenge for urology surgeons. In these cases it is difficult to free the renal unit in one sitting, the chances of acquiring post-operative complications are high, stone free rates are low and priori of second procedure are more. However, in our study duration of hospitalisation, bleeding, complications and haemoglobin drop were significantly lower than in many other studies.[10,11,13,14] Although this study had a limited number of patients but a longer follow up is required to predict limitations and benefits of the procedure.

Conclusion

Simultaneous bilateral PCNL is not allied with higher morbidity than the unilateral routine. The bilateral renal stone burden can be easily managed via Simultaneous bilateral PCNL. Although this method is not old enough to evaluate long term complications and outcomes, but with proper classification of stone characteristics, such as Guy's stone scoring system the results can be changed considerably. The bilateral simultaneous PCNL can be performed after complete counseling of subjects regarding potential complications, post-operative time, and pain management techniques. Other complications of Simultaneous bilateral PCNL are almost similar to unilateral PCNL.

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Conflict of Interest: None.

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